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MAMMALS COLLECTED BY DR. W. L. ABBOTT ON
ISLANDS IN THE NORTH CHINA SEA.

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CONTENTS :

Introduction	203
Systematic list of species	241
Notes on the fauna of the islands visited	242

INTRODUCTION.

DURING the spring of 1899 Dr. W. L. Abbott fitted out a schooner at Singapore for the special purpose of exploring the less known coasts and islands of the East Indies. The results of the first cruise, so far as concerns the mammals, are embodied in the present paper, which is published here by permission of the Secretary of the Smithsonian Institution. The mammals, though numbering about 200 specimens, form only a part of the very extensive collections obtained, all of which have been presented to the United States National Museum.

Leaving Singapore on June 29, 1899, accompanied by Mr. C. B. Kloss, Dr. Abbott spent about three months among the islands of the North China Sea. Mammals were collected on the following islands, the location of which is shown on the accompanying map (fig. 1): Linga (July 7th to 25th), Ste. Barbe (August 1st and 2d), Tambelan group (August 13th to 15th), Anambas group (August 17th to September 28th), and Tioman (September 30th to October 4th).

So far as it is represented by this collection the mammal fauna of the islands consists of local forms of the widely distributed and

characteristic Malayan types. Each island and group of islands has its representatives of the common genera and species; but

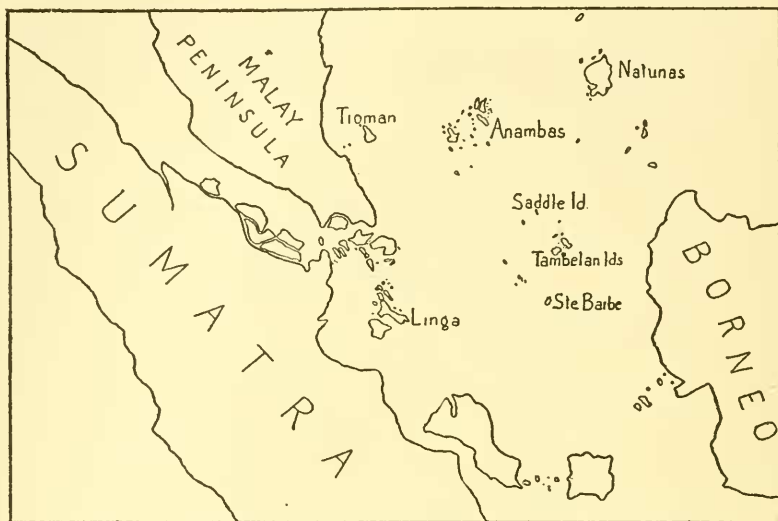


FIG. 10. Islands visited by Dr. Abbott.

in scarcely an instance is an insular race identical with that occurring on another island, unless of the same group, or on the mainland.

SYSTEMATIC LIST OF SPECIES.

MUS FLAVIVENTER sp. nov.

Type.—Adult male (skin and skull). No. 101739 United States National Museum. From Pulu Jimaja, Anambas Islands. Collected September 18, 1899.

Characters.—Similar to *Mus cremoriventer* Miller¹ from Trong, Lower Siam, but slightly larger and with entire pelage much more strongly suffused with yellow.

Fur.—The elements of the fur are as in *M. cremoriventer*.

Color.—General color above ochraceous, fading to orange-buff or buff-yellow on sides, the sides nearly clear, but back, shoulders, neck and head uniformly sprinkled with black-tipped hairs and bristles, which are nowhere in excess of the ochraceous. Cheeks clear orange buff. Muzzle broccoli-brown. Scarcely a trace of a dark eye ring.

¹ Proc. Biolog. Soc. Washington, XIII, p. 144, April 21, 1900.

Underparts and inner surface of legs pale straw-yellow to base of hairs, sharply defined from color of sides and extending to wrists and nearly to ankles. Feet yellowish white, faintly shaded with sepia. Tail and naked ears uniform dark brown throughout.

Tail as in *Mus cremoriventer*.

Skull.—The skull closely resembles that of *Mus cremoriventer*, differing only in slightly larger size and relatively smaller audital bullæ, characters that may prove to be purely individual.

Teeth as in *Mus cremoriventer*.

Measurements.—External measurements of type: total length 304; head and body 133; tail vertebræ 171; hind foot 28.5 (26.5); ear from meatus 16; ear from crown 11.5; width of ear 14. A second specimen, also a male: total length 285; head and body 133; tail vertebræ 152; hind foot 27 (25).¹

Cranial measurements of type: greatest length 34; basal length 29; basilar length 26.8; palatal length 14.4; least width of palate between anterior molars 3.8; diastema 9.4; length of incisive foramen 5.4; combined breadth of incisive foramina 3; length of nasals 13.6; combined breadth of nasals 3.8; zygomatic breadth 15.4; interorbital breadth 5.6; mastoid breadth 12.8; breadth of braincase over roots of zygomata 14; depth of braincase at front of basioccipital 10.4; frontopalatal depth at posterior extremity of nasals 7.8; least depth of rostrum immediately behind incisors 6.4; maxillary toothrow (alveoli) 5.8; width of first upper molar 1.6; mandible 17.4; mandibular toothrow (alveoli) 5.6.

Specimens examined.—Two, from the type locality.

Remarks.—*Mus flaviventer* is a yellowish, insular form of *M. cremoriventer*. It is not closely related to any of the species thus far recorded from the Natuna Islands, unless to the *Mus ephippium* of Thomas.

MUS ANAMBÆ sp. nov.

Type.—Adult female (skin and skull). No. 101737 United States National Museum. From Pulo Jimaja, Anambas Islands. Collected September 21, 1899.

Characters.—Like *Mus surifer* Miller² from Trong, Lower Siam, but with tail always much shorter than head and body.

Color.—Upper parts uniform tawny-ochraceous, heavily sprinkled with blackish brown on posterior half of back, less so on shoulders

¹ Measurement of hind foot in parenthesis is taken without claws.

² Proc. Biol. Soc. Washington, XIII, p. 148, April 21, 1900.

and head. Sides, flanks, cheeks and outer surface of legs clear tawny-ochraceous. Underparts soiled yellowish white to base of hairs. The white extends down inner side of front legs to wrists, but on hind legs, as in *Mus surifer*, it is usually interrupted between knee and heel. Feet dull white. Ears and dorsal surface of tail to terminal third or fourth dark brown. Underside of tail and whole of terminal third or fourth dull white. Underfur of back light slate color.

Skull and teeth as in *Mus surifer*.

Measurements.—Three adults measure as follows: No. 101737, ♀, Pulo Jimaja (type); total length 330; head and body 178; tail vertebræ 152; hind foot 40 (39); ear from meatus 21; ear from crown 17; width of ear 16. No. 101738, ♂, Pulo Jimaja; total length 330; head and body 178; tail vertebræ 152; hind foot 40 (39). No. 101701, ♀, Pulo Siantan; total length 343; head and body 184; tail vertebræ 159; hind foot 41 (39).

Specimens examined.—Five, all from the Anambas; two taken on Pulo Jimaja and three on Pulo Siantan.

Remarks.—Though closely related to *Mus surifer* this species is readily distinguishable by its much shorter tail.

MUS LINGENSIS sp. nov.

Type.—Adult male (skin and skull). No. 101614 United States National Museum. From Linga Island. Collected July 15, 1899.

Characters.—Closely related to *Mus surifer* and *M. pellax*; size and cranial characters as in the former, color more nearly like that of latter. White of inner side of hind leg broadly continuous with that of dorsal surface of foot. Bony palate narrower than in the allied species.

Color.—Dorsal surface an indescribable grizzle of dark hair-brown, clay color, and drab, darkest on middle of back, lightest and most tinged with yellow on neck. Sides drab, slightly varied with hair-brown and clay color. Ventral surface of body and inner side of legs white tinged with cream color. The white of the hind leg is broadly continuous with that of dorsal surface of foot. A distinct blackish eye ring. Tail bicolor, whitish below and at tip, elsewhere dark brown.

Skull and teeth.—The skull closely resembles that of *Mus surifer* except in the form of the bony palate. This is more elongate than in either of the related mainland species or in *M. anamba*. The ratio of width of palate between anterior molars to distance between posterior border of incisive foramen and anterior border of interpterygoid space is 42 and 43 respectively in two specimens of *Mus lingensis*,

while in two of *M. surifer* it is 57 and 60, in the type of *M. anambæ* 60, and in the type of *M. pellax* 55. Teeth as in *Mus surifer*.

Measurements.—External measurements of type: total length 387; head and body 216; tail vertebræ 171; hind foot 42 (40.4); ear from meatus 21; ear from crown 16; width of ear 16. Average of five adults: total length 381 (362–400); head and body 215 (203–229); tail vertebræ 169 (159–184); hind foot 40.2 (38–43); hind foot without claws 38.7 (37–42).

Cranial measurements of type: greatest length 47.5; basal length 40.4; basilar length 37.5; palatal length 21.8; least width of palate between anterior molars 4.4; diastema 13.4; length of incisive foramen 7; combined breadth of incisive foramina 4; length of nasal 19; combined breadth of nasals 5.4; zygomatic breadth 20; interorbital breadth 6.8; mastoid breadth 15.4; breadth of braincase over roots of zygomata 17; depth of braincase at front of basioccipital 11.4; frontopalatal depth at posterior extremity of nasals 11; least depth of rostrum immediately behind incisors 8.8; maxillary tooth-row (alveoli) 8; width of first upper molar 2.2; mandible 25.4; mandibular tooth-row (alveoli) 7.2.

Specimens examined.—Six, all taken on Linga Island, at an altitude of about 1000 feet.

Remarks.—The dull color of the six specimens of *Mus lingensis* is evidently due in part to the abraded condition of the pelage in most of the individuals taken. After due allowance is made for this, however, the differences separating the animal from *Mus surifer* are still very appreciable.

MUS STREPITANS sp. nov.

Type.—Adult female (skin and skull). No. 101697 United States National Museum. From Pulo Siantan, Anambas Island. Collected September 10, 1899.

Characters.—Similar to *Mus vociferans* Miller¹ from Trong, Lower Siam, but color darker throughout, and ventral surface pale yellow instead of dull white. Skull as in the Bornean *Mus sabanus*.

Color.—Back and sides ochraceous-buff, duller on back, clearer on sides, everywhere sprinkled with blackish brown. The brown predominates on back and shoulders, gradually giving way on sides to the ochraceous-buff which, however, is nowhere without at least a faint sprinkling of brown. Cheeks and outer side of front legs nearly clear ochraceous-buff. Entire ventral surface and inner side of front legs

¹ Proc. Biolog. Soc. Washington, XIII, p. 138, April 21, 1900.

pale straw-yellow, brighter on chest, duller and more nearly cream color posteriorly. The yellow of legs is continuous with dirty white of upper surface of feet. Metapodials heavily shaded with brown. Tail dull light brown, indistinctly paler beneath and throughout terminal third.

Skull and teeth.—The skull differs from that of *Mus vociferans* and resembles that of *M. sabanus* in the elevation of the region about posterior extremity of nasals. The character is one that is almost impossible to describe, but which is readily appreciated on comparison of specimens. Teeth as in the related species.

Measurements.—External measurements of type: total length 565; head and body 241; tail vertebræ 324; hind foot 47 (43.6); ear from meatus 22; ear from crown 20; width of ear 18. Four specimens from Pulo Siantan average: total length 546 (509–584); head and body 235 (222–248); tail vertebræ 311 (298–336); hind foot 46.4 (45–47); hind foot without claws 44.1 (43–45). Three specimens from Pulo Jimaja average: total length 551 (547–559); head and body 233 (229–241); tail vertebræ 318; hind foot 45.5 (45–46); hind foot without claws 44 (43–45).

Cranial measurements of type: greatest length 57; basal length 48; basilar length 45; palatal length 25.4; least width of palate between anterior molars 5; diastema 15.6; length of incisive foramen 8; combined breadth of incisive foramina 4; length of nasals 11.8; combined breadth of nasals 6; zygomatic breadth 25; interorbital breadth 9.6; mastoid breadth 19; breadth of braincase over roots of zygomata 20; depth of braincase at front of basioccipital 13.8; frontopalatal depth at posterior extremity of nasals 14; least depth of rostrum immediately behind incisors 10; maxillary tooththrow (alveoli) 10; width of first upper molar 3; mandible 32.4; mandibular tooththrow (alveoli) 9.6.

Specimens examined.—Seven; four from Pulo Siantan and three from Pulo Jimaja.

Remarks.—Its dark color immediately distinguishes this rat from *Mus vociferans* and *M. sabanus*. The seven specimens are remarkably constant in all their characters, both external and cranial. None of them show a tendency to become markedly paler and yellower across the shoulders so conspicuous in *Mus vociferans*. Dr. Abbott notes that the animal is quite as noisy as its mainland representative.

? MUS VOCIFERANS Miller.

A single much abraded specimen (♀ No. 101756) taken on Tioman Island, October 3, 1899, is probably referable to this species. Its

tail is defective and the pelage is so worn that the underfur appears at the surface in irregular patches. Under the circumstances any exact determination is impossible. In its whitish belly and in the form of the skull the animal agrees with *Mus vociferans* and shows no approach toward the characters of *M. strepitans*.

MUS TIOMANICUS sp. nov.

Type.—Adult male (skin and skull). No. 101763 United States National Museum. From Tioman Island. Collected October 4, 1899.

Characters.—In size, proportions, quality of fur, and cranial characters similar to the form of *Mus alexandrinus* occurring in Trong, Lower Siam, but color throughout much darker.

Color.—Dorsal surface raw umber heavily and finely grizzled with blackish brown, the fur faintly lustrous in certain lights. Sides and cheeks slightly paler than back and much less profusely sprinkled with dark hairs. Ventral surface dull white, the chin and throat tinged with cream-buff, the chest faintly washed with brown. Throughout the pelage except on chin and throat the hairs are light slate-gray at base. Outer surface of front legs drab-gray. Inner surface of all four legs like belly. Muzzle and dorsal surface of feet dull sepia. Tail uniform dark brown throughout.

Skull and teeth.—In both cranial and dental characters this species is practically identical with the form of *Mus alexandrinus* found in

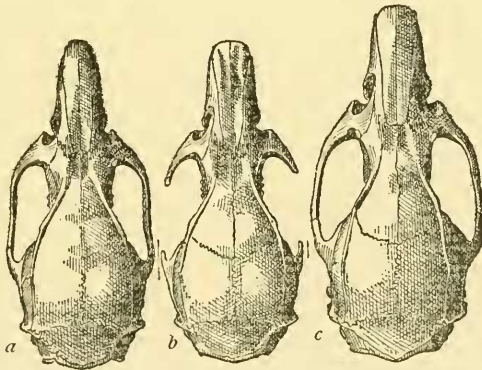


FIG. 11. a *Mus tiomanicus*. b *M. siantanicus*. c *M. tambelanicus*.
Natural size.

Trong, Lower Siam. The skull as a whole is, however, slightly more elongate than in the mainland animal, the difference most noticeable

in the region of the anterior zygomatic roots, and in the posterior portion of the braincase. The antero-posterior diameter of the interparietal is usually greater than in the mainland form; though this character is not wholly constant it is sufficiently so to differentiate series of specimens.

Measurements.—External measurements of the type: total length 362; head and body 171; tail vertebræ 191; hind foot 37 (35); ear from meatus 20.4; ear from crown 15.8; width of ear 15.6. Average of four adults from the type locality: total length 375 (362-381); head and body 184 (171-197); tail vertebræ 189 (184-197); hind foot 36.5 (34-38); hind foot without claws 34.5 (33-35).

Cranial measurements of type: greatest length 43 (41);¹ basal length 37 (36); basilar length 34 (33.6); palatal length 20 (19.4); least width of palate between anterior molars 4.4 (4.4); diastema 11.6 (11.4); length of incisive foramen 7.8 (7.6); combined breadth of incisive foramina 3 (3); length of nasals 15.4 (14.4); combined breadth of nasals 4.4 (3); zygomatic breadth 19 (20); interorbital breadth 6 (6.4); mastoid breadth 16.4 (16.6); breadth of braincase over roots of zygomata 15.4 (16.4); depth of braincase at front of basioccipital 11.6 (11); frontopalatal depth at posterior extremity of nasals 9.4 (9.6); least depth of rostrum immediately behind incisors 7.8 (7.8); maxillary toothrow (alveoli) 7 (7.6); width of first upper molar 2 (2); mandible 23.6 (22.4); mandibular toothrow (alveoli) 7 (7).

Specimens examined.—Eleven, all from the type locality.

Remarks.—On comparison of the eleven specimens of *Mus tionanicus* with ten of the continental race of *Mus alexandrinus* from Trong the differences in color are seen to be remarkably constant. The slight cranial peculiarities of the insular form, while hardly sufficient by themselves to separate the animal, are of undoubted significance when considered in connection with the external characters. For comparison with the allied insular species see description of *Mus tambelanicus*, p. 213.

MUS SIANTANICUS sp. nov.

Type.—Adult male (skin and skull). No. 101705 United States National Museum. From Pulo Siantan, Anambas Islands. Collected September 11, 1899.

Characters.—Size, proportions, quality of fur, and color essentially

¹ Measurements in parenthesis are those of an adult male *Mus alexandrinus* from Trong (No. 84395).

as in the form of *Mus* 'alexandrinus' occurring in Trong, Lower Siam, but skull with noticeably broader, less arched rostrum.

Color.—Dorsal surface a fine grizzle of dull ochraceous-buff and brownish black, the hairs with a distinct gloss in certain lights. On shoulders and middle of back the brown predominates, and at the same time the ochraceous-buff is duller and paler than elsewhere. On sides, flanks and across lumbar region the dark hairs are less numerous and the ochraceous-buff is distinctly tinged with russet. Ventral surface of body and inner side of legs yellowish white, darker, and somewhat brownish tinged across chest. Fur of back pale slate-gray at base, that of ventral surface mostly unicolor to base, but irregularly tinged with gray beneath the surface. Feet light brown. Tail uniform dark brown throughout.

Skull and teeth.—The skull of *Mus siantanicus* is essentially like that of *M. tiomanicus* and *M.* 'alexandrinus' except in the form of the rostrum. This differs conspicuously from that of the related species in its breadth, and in the flatness of the dorsal surface. The characters are most noticeable when the skull is viewed from directly in front. It is then seen that the nasal bones are very slightly depressed at the sides only, while in *Mus tiomanicus* and *M. alexandrinus* they are uniformly arched from suture to periphery, the outline of the two together forming nearly one-half of a circle. Viewed from the side, the dorsal profile of the rostrum appears nearly straight. Viewed from beneath, the sides are seen to be more nearly parallel than in the two related species. Teeth in no way peculiar.

Measurements.—External measurements of type: total length 356; head and body 191; tail vertebræ 165; hind foot 35 (33); ear from meatus 17.8; ear from crown 14.8; width of ear 15. Average of five adults from the type locality; total length 365 (349–382); head and body 186 (178–191); tail vertebræ 179 (165–191); hind foot 35.6 (35–36); hind foot without claws 36.9 (33–35).

Cranial measurements of type: greatest length 42; basal length 37; basilar length 35; palatal length 21; least width of palate between anterior molars 4; diastema 12; length of incisive foramen 8; combined breadth of incisive foramina 3; length of nasals 15.4; combined breadth of nasals 4.6; zygomatic breadth 18; interorbital breadth 6.4; mastoid breadth 15.6; breadth of braincase over roots of zygomatica 16.4; depth of braincase at front of basioccipital 12; fronto-palatal depth at posterior extremity of nasals 9.4; least depth of rostrum immediately behind incisors 7; maxillary toothrow (alveoli) 7; width of first upper molar 2; mandible 23.6; mandibular toothrow (alveoli) 7.

Specimens examined.—Six, all from the type locality.

Remarks.—Unlike the Tioman rat, *Mus siantanicus* retains the external appearance of the mainland form, but differs widely in its cranial characters. In the latter it shows an approach to the much larger Tambelan representative of the group.

MUS TAMBELANICUS sp. nov.

Type.—Adult male (skin and skull). No. 101665 United States National Museum. From Big Tambelan Island. Collected August 10, 1899.

Characters.—Much larger than *Mus siantanicus* or the form of *M. alexandrinus* occurring in Trong, Lower Siam. Fur coarser than in the related species; color about as in *Mus tiomanicus*, or slightly more red, but ventral surface darker and more yellow. Skull with rostrum relatively even more heavily built than in *Mus siantanicus*, but with dorsal surface less flattened.

Color.—Back a fine grizzle of dull cinnamon and blackish brown, the two colors nearly equally mixed. Sides nearly clear cinnamon, brightening to russet on flanks. Ventral surface dull buff, faintly and irregularly marked with brownish, and very obscurely contrasted with color of sides. Feet sepia. Tail uniform dark brown throughout.

Skull.—The skull most nearly resembles that of *Mus siantanicus* but is much larger and the rostrum is relatively broader than in the Anambas species. *Region between anterior zygomatic roots convex laterally*, not flat or concave as in the allied species. Dorsal profile of nasals when viewed from in front slightly convex, but much less so than in *Mus tiomanicus* and the Trong form of *M. alexandrinus*. Lateral margins of rostrum nearly parallel. Teeth larger than in the related species, but not disproportionately so.

Measurements.—External measurements of type: head and body (tail imperfect) 216; hind foot 42 (39); ear from meatus 21; ear from crown 15; width of ear 16.4. Two adults from Pulo Bunoa measure: (No. 101646, ♀) total length 425; head and body 203; tail vertebrae 222; hind foot 40 (37); and (No. 101642, ♀) total length 375; head and body 181; tail vertebrae 191; hind foot 40 (37). An adult male (No. 101669) from Pulo Wai measures: total length 393; head and body 191; tail vertebrae 203; hind foot 41 (38).

Cranial measurements of type: greatest length 47; basal length 41; basilar length 38; palatal length 24; least width of palate between anterior molars 4.6; diastema 13; length of incisive foramen 8; combined breadth of incisive foramina 3.8; length of nasals 17; com-

bined breadth of nasals 5.4; zygomatic breadth 22.4; interorbital breadth 7; mastoid breadth 18; breadth of braincase over roots of zygomata 17.6; depth of braincase at front of basioccipital 12.8; frontopalatal depth at posterior extremity of nasals 11.4; least depth of rostrum immediately behind incisors 8.8; maxillary toothrow (alveoli) 8; width of first upper molar 2.4; mandible 26.4; mandibular toothrow (alveoli) 7.4.

Specimens examined.—Five, one adult from Big Tambelan Island, two from Pulo Bunoa, an adult from Pulo Wai, and an immature individual from Pulo Gilla.

Remarks.—*Mus tambelanicus* marks, so far as the species represented by the present collection are concerned, the culmination of a series beginning with the light colored, slender skulled animal of Trong. The first step away from this type is represented by *Mus tiomanicus*, in which the color is distinctly darkened, but in which the cranial characters remain practically unchanged. In the representative of the group occurring on the Anambas the rostrum is noticeably altered in form, though the color is less affected than in the Tioman animal. Finally, in the Tambelan Islands a race has been developed carrying the cranial peculiarities even further than in that inhabiting the Anambas; the changes in form of skull accompanied by marked increase in the general size of the animal, in the quality of the fur and in the color. The characters of each of these closely related species are remarkably constant in view of the reputation for variation enjoyed by *Mus alexandrius*. The adult specimen of *M. tambelanicus* from Pulo Wai differs from the skins from Big Tambelan in less yellow ventral surface, but otherwise it is not peculiar.

The specimen from Pulo Gilla is too immature to be comparable with the others.

MUS OBSCURUS sp. nov.

Type.—Adult male (skin and skull). No. 101764 United States National Museum. From Tioman Island. Collected October 1, 1899.

Characters.—Similar to *Mus concolor* Blyth, but larger, and with more coarsely spinous fur. Skull larger than that of *Mus concolor*, the dorsal profile less convex, the audital bullæ larger and teeth relatively smaller.

Color.—General appearance that of a much overgrown house-mouse. Dorsal surface a fine grizzle of seal brown and dull ochraceous-buff, the former predominating on crown of head and in lumbar

region, the latter slightly in excess on rump, flanks and shoulders, as well as on sides of body and outer surface of legs. Ventral surface of body and inner side of legs pale drab, irregularly and faintly washed with brownish yellow. Feet drab-gray. Tail uniform dark brown throughout. Fur of body everywhere slate-gray at base.

Fur.—The fur is rather short, about 8 mm. in length on middle of back, and everywhere thickly and uniformly sprinkled with well developed, slender, grooved bristles. On lower part of sides the bristles become even more slender, while on ventral surface they are at first sight not noticeably different from ordinary hairs.

Tail.—The tail is closely and uniformly annulated; about 16 rings to the centimeter at middle. Though sharply distinguished from each other, the rings are very obscurely divided into scales. Tail uniformly clothed with very short hairs (their length mostly about double width of rings) which neither hide the annulation nor form a terminal pencil.

Feet.—Soles 6-tuberculate, the sixth pad well developed. The surface of the sole appears (on soaking the foot of the dry specimen) to be distinctly and closely reticulate in the region between the pads, but perfectly smooth behind them.

Skull.—As compared with a skull of *Mus concolor* from Bhamo, Burmah (No. 10519 United States National Museum), that of *M. obscurus* differs noticeably in its larger size, more slender rostrum, and particularly in the less convex profile when viewed from the side. The antorbital foramina are larger than in the related species, and less contracted below. Audital bullæ relatively as well as actually larger than in *Mus concolor*, and not very different in form.

Teeth.—The teeth are essentially as in *Mus concolor*, but actually smaller.

Measurements.—Total length 254; head and body 121; tail vertebrae 133; hind foot 24 (22.6); ear from meatus 16; ear from crown 13; width of ear 13.

Skull: greatest length 30 (28.6);¹ basal length 26 (24); basilar length 23 (21.8); palatal length 13 (12); least width of palate between anterior molars, 3.2 (2.8); diastema 8 (7); length of incisive foramen 5.4 (5); combined breadth of incisive foramina 2 (1.8); length of nasals 11 (10.2); combined breadth of nasals 3 (3); zygomatic breadth 13.6 (13); interorbital breadth 4 (5); mastoid breadth 12 (12); breadth of braincase over roots of zygomatics 13 (12.6); depth

¹Measurements in parenthesis are those of an adult female *Mus concolor* from Bhamo, Burmah.

of braincase at front of basioccipital 9 (8.4); frontopalatal depth at posterior extremity of nasals 6.6 (6); least depth of rostrum immediately behind incisors 5 (4.8) maxillary toothrow (alveoli) 4.6 (5); width of first upper molar 1.6 (1.6); mandible 15.4 (14.6); mandibular toothrow (alveoli) 4.6 (5).

Specimens examined.—One, the type.

Remarks.—*Mus obscurus* will probably be found to occur on the mainland of the Malay Peninsula, where its range is likely to coincide with that of *Mus surifer* and *Mus vociferans*.

RATUFA ANAMBÆ sp. nov.

Type.—Adult male (skin and skull). No. 101725 United States National Museum. From Pulo Jimaja, Anambas Islands. Collected September 25, 1899.

Characters.—In color and in cranial characters similar to *Ratufa melanopepla*, but size nearly equal to that of *Ratufa gigantea*. Ears not tufted.

Color.—Cheeks, throat, sides of neck, inner surface of legs, and entire ventral surface of body rich tawny yellow (ochraceous) paler on throat, cheeks, and sides of neck, richer on chest, the belly much darkened by appearance at surface of blackish bases of hairs. Remainder of pelage and entire tail glossy blue-black, with the usual reddish brown cast beneath the surface. Yellow of front leg spreading conspicuously over outer side between elbow and wrist.

Skull and teeth.—Except for their distinctly larger size the skull and teeth scarcely differ from those of *R. melanopepla*. Audital bullæ narrower and more elevated above surface of basioccipital (when skull is held upside down) than in *R. melanopepla*, the peculiarity in form the same as that of the Tioman race, but more accentuated.

Measurements.—External measurements of type: total length 825; head and body 374; tail vertebræ 451; pencil 100; hind foot 83 (76). Average of six specimens from the type locality: total length 806 (781–838); head and body 370 (356–381); tail vertebræ 436 (400–470); hind foot 82.8 (82–84); hind foot without claws 75.8 (75–77).

Cranial measurements of type: greatest length 72; basal length 60; basilar length 56; palatal length 28; length of nasals 25; breadth of nasals anteriorly 13; breadth of nasals posteriorly 8.6; interorbital breadth 26; breadth between tips of postorbital processes 40; zygomatic breadth 45; mastoid breadth 33; breadth of palate between premolars 9; depth of rostrum at posterior extremity of nasals 21; mandible 42; depth of mandible at posterior root of premolar 11.4;

least depth of mandible between incisor and premolar 10.2; maxillary toothrow (alveoli) 14; breadth across both upper incisors at rim of alveoli 9.8; mandibular toothrow (alveoli) 14.8.

Specimens examined.—Six, all from the type locality.

Remarks.—This is an insular race characterized, contrary to the general rule, by increase in size. Its peculiarities are well marked and constant.

RATUFA TIOMANENSIS sp. nov.

Type.—Adult male skin and (skull). No. 101751 United States National Museum. From Tioman Island. Collected October 4, 1899.

Characters.—Color exactly similar to that of *Ratufa anambæ* and *R. melanopepla*, but size smaller and tail relatively longer than in either. Skull like that of *R. melanopepla*, but with more inflated audital bullæ.

Color.—See description of *Ratufa anambæ*, which applies equally well to this animal.

Skull.—In size and general form the skull of *Ratufa tiomanensis* so closely agrees with that of *R. melanopepla* that no special description is necessary. The audital bullæ are, however, slightly though constantly different in form. Though of about the same size as in *R. melanopepla* the bullæ are more inflated, so that when viewed from behind (the skull held upside down) they appear to rise higher and more abruptly above surface of basioccipital. This character, though slight, is readily appreciable when specimens are compared, and its constancy makes it of more importance than would at first sight be supposed.

Measurements.—External measurements of type: total length 724; head and body 368; tail vertebræ 356; pencil 90; hind foot 78 (72). Average of five specimens from the type locality: total length 740 (724-762); head and body 343 (305-368); tail vertebræ 397 (356-419); hind foot 76.4 (74-78); hind foot without claws 69.8 (68-72).

Cranial measurements of type: greatest length 68.4 (70);¹ basal length 56.4 (59); basilar length 52 (53); palatal length 26 (26.4); diastema 15.4 (16); length of nasals 23 (23.4); breadth of nasals anteriorly 12.6 (13); breadth of nasals posteriorly 7 (7); interorbital breadth 26 (28); breadth between tips of postorbital processes 39 (41); zygomatic breadth 42.4 (44); mastoid breadth 31 (32.6); breadth of palate between premolars 10 (10); depth of rostrum at

¹Measurements in parenthesis are those of the type of *Ratufa melanopepla*.

posterior extremity of nasals 18.6 (18.8); mandible 41 (41.6) depth of mandible at posterior root of premolar 11.4 (11); maxillary tooth-row (alveoli) 13 (14); breadth across both upper incisors together at rim of alveoli 8.4 (8); mandibular tooth-row (alveoli) 14 (14.4).

Specimens examined.—Five, all from the type locality.

Remarks.—*Ratufa tiomanensis* is less differentiated from *R. melanopepla* than is the Anambas form. Nevertheless its characters are easily recognizable on comparison, while their constancy is very marked.

FUNAMBULUS CASTANEUS sp. nov.

Type.—Immature male (skin and skull). No. 101696 United States National Museum. From Pulo Siantan, Anambas Islands. Collected September 10, 1899.

Characters.—Similar to the form of *Funambulus insignis* occurring in Trong, Lower Siam, but darker in color, and sides and flanks not grizzled; skull with much larger audital bullæ.

Color.—Sides, flanks, and outer surface of legs clear chestnut, the individual hairs slate-gray at base, ferruginous at middle and black at tip. The color is brightest on flanks and palest on front legs and sides of head. Neck and middle of back grizzled gray faintly washed with tawny. Top of head similar but with tawny tinge more conspicuous. In lumbar region and on rump the gray gives place gradually to color of flanks. The gray area is bounded on each side and divided in the middle by a black stripe about 3 mm. in breadth. These three black stripes begin a little in front of shoulders and extend to rump, where they disappear. The two stripes into which the gray area is thus divided are each about 5 mm. in width. Ventral surface of body and inner side of legs soiled yellowish white to base of hairs, the inner side of hind legs strongly washed with ferruginous. Feet a dull grizzle of black and tawny. Ears brownish internally, whitish externally. The hairs of the tail are black at base (3 mm.) then light, dull ferruginous (5 mm.), followed by black (10 mm.), the extreme tips whitish. On dorsal surface the ferruginous is nearly concealed by the black, but on ventral surface it forms a well-defined median area.

Skull.—The type specimen is so young that no accurate description of the cranial characters can be given. The audital bullæ, however, are actually larger than in a fully adult specimen of *Funambulus insignis* from Trong. They are so large that when viewed from the side they conceal the tips of the pterygoids, which in *F. insignis* are plainly visible.

Measurements.—External measurements of type: total length 241; head and body 152; tail vertebræ 89; pencil 30; hind foot 45 (41).

Specimen examined.—One, the type.

Remarks.—Although the only specimen of this squirrel is immature (crown of last upper molar at rim of alveolus) its characters appear to be quite sufficient to separate the Anambas form from that of the mainland. It is probably more closely allied to the much brighter colored *Funambulus diversus* (Thomas) of Borneo.

SCIURUS MIMELLUS sp. nov.

Type.—Adult male (skin and skull). No. 101668 United States National Museum. From Pulo Wai, Tambelan Islands. Collected August 13, 1899.

Characters.—A miniature of *Sciurus przewostii* (hind foot about 53 instead of 63, greatest length of skull 51 instead of 58).

Color.—Entire tail, dorsal surface of head and body, and outer surface of hind legs glossy black to base of hairs. Underparts, feet, inner side of hind leg, and entire fore leg bright reddish chestnut (brighter than Ridgway's pl. IV, No. 9) fading to cinnamon-rufous on thighs and to light orange-rufous on outer side of upper arms. Black of back separated from red of belly by a lateral band of white beginning just behind axilla and extending down front of hind leg to knee and about 12 mm. wide at middle. Cheeks, chin and sides of neck grizzled bluish gray. Sides of muzzle whitish. Whiskers and ears black. The fur of the red area is everywhere red to base except on sides, close to white stripe. Here it is blackish beneath the surface.

Skull.—Except for its smaller size the skull of *Sciurus mimellus* exactly resembles that of *S. przewostii*.

Measurements.—External measurements of type: total length 451; head and body 229; tail vertebræ 222; pencil 60; hind foot 55 (51). A somewhat younger individual (female) from the type locality: total length 442; head and body 222; tail vertebræ 210; pencil 60; hind foot 54 (51).

Cranial measurements of type: greatest length 51.6 (58¹); basal length 43.6 (52); basilar length 40.6 (48.4); palatal length 22.8 (26); length of nasals 15 (19); breadth of nasals anteriorly 72 (8.8); breadth of nasals posteriorly 4.4 (5); interorbital breadth, 18.4 (24.8);

¹ Measurements in parenthesis are those of an adult female *Sciurus przewostii* from Trong, Lower Siam.

breadth between tips of postorbital processes 27.4 (34); zygomatic breadth 31 (37); mastoid breadth 21.4 (25); breadth of palate between premolars 6.8 (8.4); depth of rostrum at posterior extremity of nasals 12.8 (13.6); mandible 31.4 (37); depth of mandible at posterior root of large premolars 8 (9); maxillary toothrow (alveoli) 10 (11); breadth across both upper incisors together at rim of alveoli 5 (6); mandibular toothrow (alveoli) 10 (11.4).

Specimens examined.—Two, both from the type locality.

Remarks.—*Sciurus mimellus* is distinguished from *S. prevostii*, aside from its size, by the reduction in width of the white lateral band. In the mainland animal this band is so wide that on the hind leg it occupies the entire outer side, reducing the black to a mere inconspicuous line between it and the red. In *S. mimellus* on the other hand the white occupies rather less space on the leg than the black, so that the latter color is more conspicuous than the white when the skin is viewed from above. Six adult specimens of *Sciurus prevostii* from Trong, Lower Siam, measure: total length, 533 (502–553); head and body 262 (248–273); tail vertebræ 275 (254–286); hind foot 62.5 (60–65); hind foot without claws 58 (56–60).

SCIURUS MIMICULUS sp. nov.

Type.—Adult male (skin and skull). No. 101616 United States National Museum. From Ste. Barbe Island. Collected August 1, 1899.

Characters.—Similar to *Sciurus mimellus* but even smaller (hind foot about 40, greatest length of skull about 48).

Color.—In color *Sciurus mimiculus* exactly agrees with *S. mimellus*, even to the narrowing of the white lateral band and consequent increase in the amount of black on the hind leg as compared with *S. prevostii*.

Skull.—The skull (fig. 12, a) is as in *Sciurus mimellus*, though much smaller. Audital bullæ slightly less inflated than in the larger species.

Measurements.—External measurements of type: total length 381; head and body 203; tail vertebræ 178; pencil 50; hind foot 42 (38). Average of nine specimens from the type locality: total length 387 (375–406); head and body 198 (191–203); tail vertebræ 189 (178–203); hind foot 43.5 (42–49); hind foot without claws 42.4 (38–45).

Cranial measurements of type: greatest length 48; basal length 41; basilar length 38; palatal length 20; length of nasals 14; breadth of nasals anteriorly 7; breadth of nasals posteriorly 5; interorbital

breadth 19; breadth between tips of postorbital processes 27; zygomatic breadth 29; mastoid breadth 20; breadth of palate between premolars 6; depth of rostrum at posterior extremity of nasals 11.8; mandible 28.8; depth of mandible at posterior root of large premolar 7.2; maxillary toothrow (alveoli) 9; breadth across both upper incisors together at rim of alveoli 4.6; mandibular toothrow (alveoli) 9.

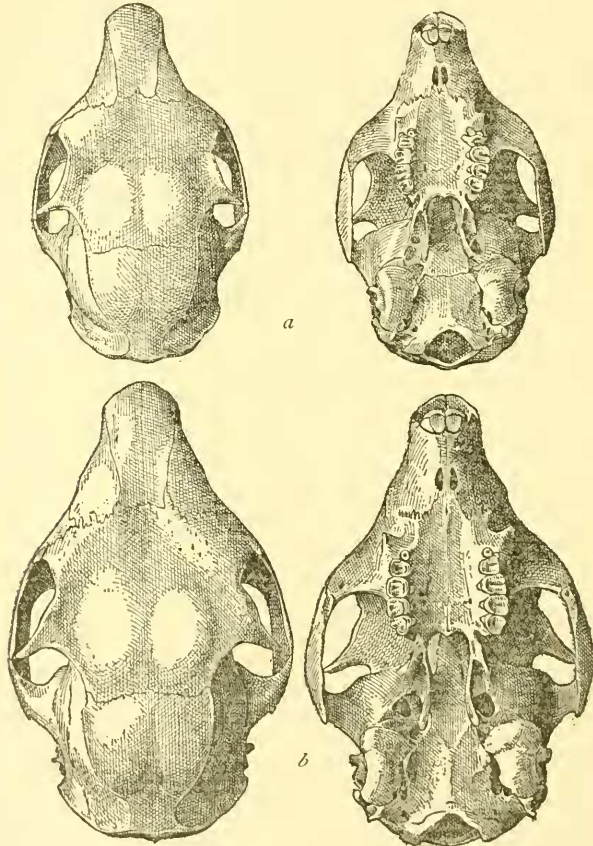


FIG. 12. *a* *Sciurus mimiculus*. *b* *Sciurus prevostii*. Natural size.

Specimens examined.—Nine, all from the type locality.

Remarks.—One of the specimens of this species (δ No. 101617, August 1) is in very abraded pelage, the longer hairs of the back being for the most part worn away. Yet there is no appreciable change in color. The tail has become a dark, indefinite brown, but the remainder of the pelage retains its colors practically unaltered.

SCIURUS TENUIS Horsfield.

1824. *Sciurus tenuis* HORSFIELD, Zoölogical Researches in Java and the neighboring Islands. (Pages not numbered.) Type from Singapore.

Specimens of this squirrel indistinguishable from topotypes were taken on the following islands:

Linga; one adult female.

Anambas; Pulo Siantan, nine specimens of both sexes; Pulo Mobur, one adult male; Pulo Jimaja, one adult female.

Tioman; one adult male.

SCIURUS NOTATUS Boddaert.

1785. *Sciurus notatus* BODDAERT, "Elenchus Mammalium, p. 119."

Four females collected on Linga Island, July 9–21, agree in all respects with the form of *Sciurus notatus* occurring at Singapore. Whether this is true *notatus* cannot now be determined.

SCIURUS TENUIROSTRIS sp. nov.

Type.—Adult female (skin and skull). No. 101753 United States National Museum. From Tioman Island. Collected September 30, 1899.

Characters.—Externally similar to *Sciurus notatus* from Singapore. Skull with rostral portion more slender and lightly built than in the continental forms.

Color.—Entire dorsal surface of head and body a fine grizzle of black and yellowish wood-brown, the individual hairs black with two or often three brown rings. The wood-brown is (at the surface) everywhere in excess of the black. Cheeks, outer surface of legs and upper surface of feet dull cinnamon, faintly grizzled. Underparts and inner side of legs orange-rufous, brightest posteriorly (where it closely agrees with Ridgway's figure), considerably paler on chest, throat and inner side of front legs. On sides the color of belly is separated from that of back by two longitudinal stripes extending from just behind axilla to flank, the lower black, the upper buff. Though the width of the stripes is somewhat variable, that of the black is usually about 10 mm., that of the buff slightly less. Dorsal surface of tail like back but less finely grizzled, each hair with five or six brown rings alternating with similar areas of black. Ventral surface even less finely grizzled and the brown distinctly tinged with cinnamon like that of flanks. Pencil in no way different from rest of tail. Whiskers black.

Skull.—The entire skull of *Sciurus tenuirostris* (fig. 13, *c*) is narrower than that of *S. notatus* from Singapore (fig. 13, *a*), but the difference is most strikingly apparent in the rostrum. The greatest width

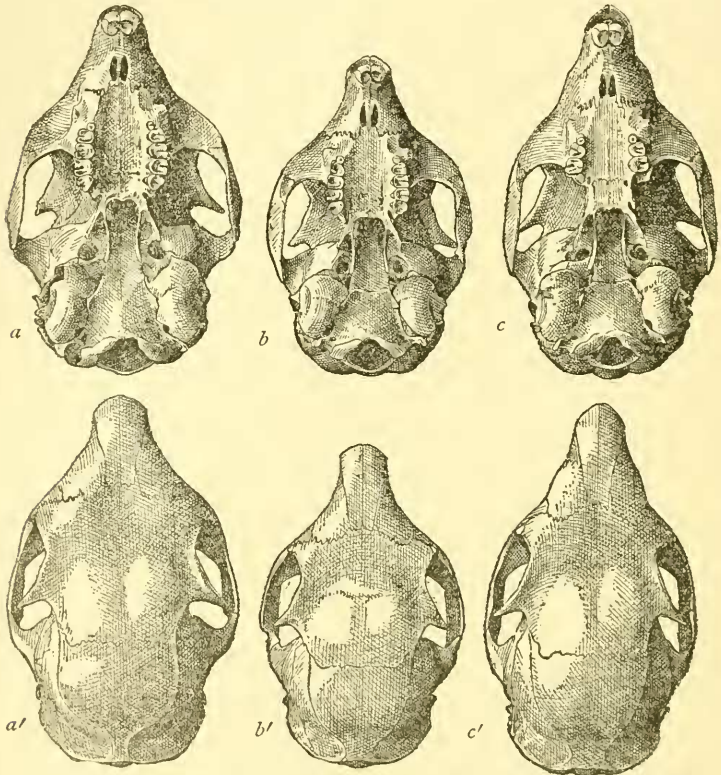


FIG. 13. *a* *Sciurus notatus*. *b* *S. klossi*. *c* *S. tenuirostris*. Natural size.

of both nasals together is more than half of nasal length in *S. notatus*, while in *S. tenuirostris* it is contained in nasal length nearly two and one-half times. Viewed from beneath the sides of the rostrum are seen to be much more contracted in *S. tenuirostris*, so that a distinct ridge extends from incisive foramina to henselion. The palate also is much narrower than in *S. notatus*. Teeth as in *S. notatus*.

Measurements.—External measurements of type: total length 356; head and body 191; tail vertebrae 165; pencil 50; hind foot 42 (40.4). A second specimen (♀ No. 101754): total length 362; head and body 191; tail vertebrae 171; pencil 55; hind foot 43 (41).

Cranial measurements of type: greatest length 50 (51)¹ basal length

¹ Measurements in parenthesis are those of an adult female *Sciurus notatus* from Singapore.

41.6 (43.6); basilar length 39 (40); palatal length 21.6 (22); diastema 11.6 (11.6); length of nasals 15.6 (15); breadth of nasals anteriorly 6 (7.8); breadth of nasals posteriorly 3 (4); interorbital breadth 17.4 (18); breadth between tips of postorbital processes 26 (28); zygomatic breadth 28 (31); mastoid breadth 20.4 (22); breadth of palate between premolars 5.6 (6.4); depth of rostrum at posterior extremity of nasals 11.8 (13); mandible 30 (29.6); depth of mandible at posterior root of large premolar 7 (8); maxillary tooth-row (alveoli) — (9.6); breadth across both upper incisors together at rim of alveoli 4 (5); mandibular toothrow (alveoli) — (9).

Specimens examined.—Two, both from the type locality.

Remarks.—The peculiarities of the skull characterize *Sciurus tenuirostris* as a strongly marked local form of the *S. notatus* group.

SCIURUS ANAMBENSIS sp. nov.

Type.—Adult female (skin and skull). No. 101686 United States National Museum. From Pulo Siantan, Anambas Islands. Collected September 12, 1899.

Characters.—Like *Sciurus notatus* from Singapore but slightly smaller; color, particularly on underparts, paler. Skull similar to that of *S. notatus* (though in some respects resembling that of *S. tenuirostris*) but somewhat smaller and with distinctly narrower palate.

Color.—Upperparts and tail as in *Sciurus notatus* and *S. tenuirostris*, but slightly paler, the difference easily perceptible on comparison but impossible to define in words. Underparts orange-rufous, but everywhere much paler than in Ridgway's figure and on the throat and inner side of front legs fading to ochraceous-buff. Outer surface of legs scarcely if at all tinged with cinnamon. Cheeks, chin, and sides of neck wood-brown. Otherwise as in *S. notatus*.

Skull.—The skull of *Sciurus anambensis*, except for its slightly smaller size, closely resembles that of *S. notatus* from Singapore. The nasals are exactly as in this species, and do not in the least suggest those of *S. tenuirostris*. On the other hand the palate is nearly as narrow as in the Tioman species, while the rostrum when viewed from below has nearly the same form as in the latter. *Audital bullæ* slightly larger than in *S. notatus* and *S. tenuirostris*. When viewed from behind (the skull held upside down) they appear to rise higher and more abruptly above level of basioccipital than in the related species. Teeth in no way peculiar.

Measurements.—External measurements of type: total length 369;

head and body 191; tail vertebræ 178; pencil 70; hind foot 44 (40.4). Average of five specimens from the type locality: total length 367 (355-375); head and body 194 (184-210); tail vertebræ 176 (171-178); hind foot 46.6 (44-49); hind foot without claws 43.6 (42-45.4). Average of five specimens from Pulo Jimaja, Anambas: total length 368 (356-381); head and body 199 (197-203); tail vertebræ 169 (165-178); hind foot 47.1 (45-48); hind foot without claws 44 (42-45). An adult female from Pulo Mata, Anambas: total length 368; head and body 203; tail vertebræ 165; hind foot 48 (44). An adult male from Pulo Riabu, Anambas: total length 362; head and body 191; tail vertebræ 171; hind foot 47 (43.6).

Cranial measurements of type: greatest length 49.6; basal length 41.4; basilar length 39; palatal length 21.4; diastema 11; length of nasals 14.4; breadth of nasals anteriorly 7; breadth of nasals posteriorly 4.2; interorbital breadth 17.4; breadth between tips of post-orbital processes 26; zygomatic breadth 29; mastoid breadth 20; breadth of palate between premolars 6.2; depth of rostrum at posterior extremity of nasals 11; mandible 29; depth of mandible at posterior root of large premolar 7; maxillary toothrow (alveoli) 9; breadth across both upper incisors at rini of alveoli 4; mandibular toothrow (alveoli) 9.

Specimens examined.—Fifteen, from the following islands of the Anambas group: Pulo Siantan, 6; Pulo Jimaja, 6; Pulo Mata, 2; Pulo Riabu, 1.

Remarks.—The plantain squirrel of the Anambas Islands is readily distinguishable from other members of the *Sciurus notatus* group, though no one of its characters alone is very striking. Specimens from the different islands agree closely with each other, the one from Pulo Riabu excepted. This differs from the others in a marked reduction in the size of the audital bullæ, in this respect approaching the Tambelan species. In other respects this specimen is typical.

SCIURUS ABBOTTII sp. nov.

Type.—Adult female (skin and skull). No. 101662 United States National Museum. From Big Tambelan Island. Collected August 10, 1899.

Characters.—Similar to *Sciurus anambensis* but skull with more slender rostrum and smaller, less inflated audital bullæ.

Color.—The color of *Sciurus abbottii* agrees so closely with that of *S. anambensis* that no detailed description is necessary. In many of the specimens there is a distinct sprinkling of grayish hairs in tawny of underparts, especially in region bordering the dark lateral stripe.

Skull.—Skull much like that of *Sciurus anambensis* in size and general form. The rostrum is more slender, particularly when viewed from below, and the audital bullæ are noticeably different in form. The bullæ are so flattened that when viewed from behind (the skull held upside down) they appear to rise scarcely above level of tips of hamulars. Each is constricted near middle by a groove extending from just behind the lateral process of basioccipital over ventral ridge of bulla and disappearing on outer side. This groove, faintly indicated in the related species, is here so greatly developed as strongly to affect the shape of the bullæ, particularly when viewed from the side.

Measurements.—External measurements of type: total length 375; head and body 197; tail vertebræ 178; pencil 60; hind foot 46 (41). Average of six specimens from the type locality: total length 373 (361–394); head and body 200 (197–203); tail vertebræ 177 (158–191); hind foot 45.2 (43–47); hind foot without claws 41.2 (40–44). Average of four specimens from Puló Bunoa, Tambelans: total length 369 (362–382); head and body 197 (184–210); tail vertebræ 171 (158–191); hind foot 44.7 (44–46.4); hind foot without claws 41.6 (40–43).

The skull is so nearly like that of *Sciurus anambensis* in size that it is unnecessary to give detailed cranial measurements. Greatest length 49; length of nasals 16; greatest breadth of both nasals together 6.6; width of palate between premolars 6.

Specimens examined.—Fourteen; ten from Big Tambelan Island, four from Pulo Bunoa.

Remarks.—This is another well marked local form of the *Sciurus notatus* group. Specimens from Big Tambelan Island and Pulo Bunoa do not differ appreciably from each other.

SCIURUS KLOSSII¹ sp. nov.

Type.—Adult male (skin and skull). No. 101678 United States National Museum. From Kaju Ara or Saddle Island, Tambelan group. Collected August 15, 1899.

Characters.—A small, blue-bellied member of the *Sciurus notatus* group, somewhat closely resembling the Bornean *S. orestes* (Thomas), but differing in much duller, more fulvous coloration. Tail with clear black pencil.

Color.—General appearance of upperparts as in *Sciurus anambensis* and *S. abbottii* but light rings on hairs of tail broader and paler, in some specimens producing indistinct cross-bars, and pencil always

¹ At Dr. Abbott's request this species is named after Mr. C. B. Kloss.

clear black, without grizzling. Outer surface of hind legs like back, that of front legs encroached upon by the bluish gray of inner surface. Feet slightly more yellow than back, and much more finely grizzled. Cheeks, chin, muzzle and sides of neck dull ochraceous, in strong contrast with color of back. Pale lateral stripe dull ochraceous buff, very slightly different from color of cheeks. Dark lateral stripe of the usual breadth, but hardly as long as in the related red-bellied species. Ears intermediate in color between cheeks and back. No light area behind ear, the hairs in this region colored like those of cheeks, but without grizzling. Underparts and inner surface of legs light gray (very nearly Ridgway's Pl. II, No. 9), slightly grizzled with ochraceous along median line and everywhere irregularly dulled by the appearance at the surface of the slate gray bases of the hairs. Under surface of tail more ochraceous than upper surface, coarsely grizzled, and not showing as strong a tendency to faint cross-barring.

Skull.—The skull of *Sciurus klossii* (fig. 13, b) is essentially a miniature of that of *S. notatus* from Singapore. It is, however, broader relatively to its length. Teeth as in *S. notatus*, due allowance being made for difference in size.

Measurements.—External measurements of type: total length 323; head and body 171; tail vertebrae 152; pencil 70; hind foot 41 (38). Average of six specimens from the type locality: total length 320 (310–330); head and body 176 (171–184); tail vertebrae 147 (140–152); hind foot 40 (38–41.6); hind foot without claws 37.1 (35–39).

Cranial measurements of type: greatest length 42; basal length 36; basilar length 33.4; palatal length 17.4; diastema 9.8; length of nasals 12; breadth of nasals anteriorly 6; breadth of nasals posteriorly 3; interorbital breadth 16; breadth between tips of postorbital processes 22.6; zygomatic breadth 26.6; mastoid breadth 19; breadth of palate between premolars 6; depth of rostrum at posterior extremity of nasals 10; mandible 25; depth of mandible at posterior root of large premolar 6; maxillary toothrow (alveoli) 8; breadth across both upper incisors at rim of alveoli 4; mandibular toothrow (alveoli) 7.6.

Specimens examined.—Nine, all from the type locality.

Remarks.—By its small size *Sciurus klossii* is separated from all the other blue-bellied members of the *S. notatus* group except *S. orestes*. I have seen no specimens of this animal, but the original description shows that it differs from the Saddle Island species in several important details of coloration, chief among which are the less fulvous cheeks,¹ white patch behind each ear, and 'white'² lateral stripe.

¹ "Cheeks and sides of muzzle less fulvous than back, instead of more so."

² "Sides with the usual lines of black and white."

TRAGULUS NAPU (F. Cuvier).

1822. *Moschus napu* F. CUVIER, Histoire Naturelle des Mammifères, iv, livr. 37. November, 1822. (Sumatra.)

One specimen (an old female with much worn teeth) of a large *Tragulus* was taken on Linga Island on July 23. It is probably identical with the *T. napu* of F. Cuvier, the type of which was collected in Sumatra. In color it is more yellow than the specimens described by Cuvier, though not approaching the red tints of the Tioman form. It measures as follows: head and body 533 (tail lacking); hind foot 120 (105); ear from meatus 34; ear from crown 30; width of ear 22. Skull: greatest length 114; basal length 106; basilar length 99; occipito-nasal length 104; length of nasals 34; breadth of nasals anteriorly 9; breadth of nasals posteriorly 11; median length of bony palate (measured from tip of premaxillary) 72; width of palate between anterior premolars 17; width between posterior molars 21; diastema 15; zygomatic breadth 48; least interorbital breadth 30; breadth between outer edges of paroccipital processes 32; greatest length of audital bulla 23.4; greatest width of audital bulla 13.4; distance between anterior extremities of audital bullæ 11; least distance between audital bullæ 6.8; depth from parietal to lower edge of audital bulla 38; depth from upper rim of orbit to alveolus of last molar 34.4; depth of rostrum at middle of diastema 18; mandible 90; maxillary toothrow (alveoli) 34; mandibular toothrow (alveoli) 39.6.

TRAGULUS RUFULUS sp. nov.

Type.—Young adult¹ male (skin and skull). No. 101767 United States National Museum. From Tioman Island. Collected September 30, 1899.

Characters.—Related to *Tragulus napu* but smaller and more brightly colored; middle permanent upper premolar with inner root nearly opposite posterior outer root, and whole form of crown proportionally altered.

Color.—Upper parts bright tawny red, closely approaching the orange-rufous of Ridgway on back, rump, tail, and outer side of thighs, slightly paler on cheeks, neck and outer side of front legs, duller on crown and face. Sides fading to ochraceous-buff. Except on neck and legs the hairs of this tawny area are everywhere tipped with black, which produces a distinct but irregular clouding

¹ Permanent dentition fully in place but practically unworn.

effect. Underparts (except throat) and inner side of legs to heel white. A dusky shade along median line of belly. Throat like neck, but with a narrow white median stripe, and on each side a well developed white lateral stripe. A white patch beneath each jaw. Tail white beneath and at tip. Ears and naked parts of muzzle, face and legs blackish in dried specimen. Hoofs horn color.

Skull.—The skull is essentially similar to that of the specimen of *T. napu* from Linga Island.

Teeth.—Teeth as in *Tragulus napu* with the exception of the middle upper premolar of the permanent dentition. In this the inner root is equidistant from each of the outer roots, with the posterior of which it is nearly in line. The bases of the three roots therefore stand at the corners of a nearly equilateral triangle. The resulting form of the crown is quite different from that in the other large species of the genus.

Measurements.—External measurements of type: total length 534; head and body 464; tail vertebræ 70; pencil 30; hind foot 120 (107); ear from meatus 31; ear from crown 27; width of ear 21.

Cranial measurements of type: greatest length 104; basal length 97; basilar length 91; occipito-nasal length, 96; length of nasals 29; breadth of nasals anteriorly 9; breadth of nasals posteriorly 11; median length of bony palate (measured from tip of premaxillary) 64; width of palate between anterior premolars 14; width between posterior molars 15; diastema 9; zygomatic breadth 46; least interorbital breadth 26.4; breadth between outer edges of paroccipital processes 28; greatest length of audital bulla 20.4; greatest width of audital bulla 12; distance between anterior extremities of audital bullæ 10; least distance between audital bullæ 6.8; depth from parietal to lower edge of audital bulla 38; depth from upper rim of orbit to alveolus of last molar 32; depth of rostrum at middle of diastema 18.6; mandible 81; maxillary toothrow (alveoli) 37; mandibular toothrow (alveoli) 42.

Remarks.—This is an insular form of the *napu* characterized by its rich, bright, color, and by the peculiar form of the middle upper premolar. It is doubtless confined to Tioman Island.

PARADOXURUS HERMAPHRODITUS (Schreber).

1778. *Viverra hermaphroditi* SCHREBER, Säugethiere, III, p. 426. ('Barbary.')

One specimen, an adult female, with much worn teeth was secured on Tioman Island, October 2, 1899. Its measurements are as follows:

total length 914; head and body 495; tail vertebræ 419; hind foot 76 (71). The fur is much paler in color than specimens from Trong, Lower Siam, and the stripes on the back show a strong tendency to break up into rows of spots. Skull of same size as in Trong specimens, but audital bullæ slightly less inflated, and paroccipital processes shorter and broader. Teeth too much worn to show any characters.

TUPAIA TANA Raffles.

1822. *Tupaia tana* RAFFLES, Trans. Linn. Soc. London, XIII, p. 257. (Sumatra.)

One specimen of this species, an adult male (No. 101597) was taken on Linga Island, July 16, 1899. Its measurements are: total length 324; head and body 191; tail vertebræ 133; pencil 25; hind foot 41 (37).

TUPAIA BUNOÆ sp. nov.

Type.—Adult female (skin and skull). No. 101640 United States National Museum. From Pulo Bunoa, Tambelan Islands. Collected August 5, 1899.

Characters.—Externally similar to *Tupaia tana* but fulvous of underparts, and especially that of under side of tail paler. Skull with broader antorbital region and larger, more inflated audital bullæ than in *T. tana*.

Color.—Back behind shoulders glossy seal-brown, the shorter hairs narrowly ringed with orange-rufous subterminally and thus producing an inconspicuous grizzle better defined in some lights than in others. On sides and outer surface of legs the brown gradually gives way to the orange rufous, but nowhere entirely disappears. Head, nape, and shoulders a fine grizzle of sepia and yellowish white, the grizzled area narrowing posteriorly and extending back in median line slightly behind shoulders. It is traversed by a median seal-brown line about 3 mm. in width, extending nape to dark area of back. Immediately over each shoulder is a faintly defined oblique pale stripe. Entire ventral surface of body and inner side of legs ochraceous, fading to ochraceous-buff on throat and chin and becoming somewhat darker and more dull (nearly clay color) on inner side of hind legs. Tail ferruginous throughout, the dorsal surface strongly washed with seal brown, especially near base. Feet, ears, and muzzle dull brown. The fur of the body is everywhere slate gray at base, less noticeably so below than above.

Skull.—The skull of *Tupaia bunoa* closely resembles that of *T. tana* from Linga Island but is slightly larger and has a distinctly less

attenuate rostrum. The suborbital vacuity is wider than in the Linga animal. Audital bullæ larger and more inflated than in *T. tana* and less distinctly triangular in outline.

Teeth.—The teeth are as in *Tupaia tana* from Linga Island. First and second upper molars with small but distinct hypocone.

Measurements.—External measurements of type: total length 362; head and body 210; tail vertebræ 152; pencil 35; hind foot 45 (42). Average of three specimens from the type locality: total length 349 (330–362); head and body 197 (178–210); tail vertebræ 152; hind foot 44.4 (43.4–45); hind foot without claws 41.3 (40–42).

Cranial measurements of type: greatest length 57.6 (54.6);¹ basal length 53 (50.4); basilar length 50 (47); median palatal length 32 (30.6); length of nasals (posterior extremity not clearly determinable) 21 (20.4); distance from lachrymal notch to a tip of premaxillary 28.4 (27.6); diastema 6 (5.6); width of palate at middle of diastema 5.2 (4.6); width of palate between anterior molars 9 (8.8); lachrymal breadth 19.8 (19); breadth of both nasals together at middle 3.6 (3); breadth of rostrum at middle of diastema 6 (5.4); least interorbital breadth 15 (14.4); zygomatic breadth 25.4 (25); breadth of braincase above roots of zygomata 19.6 (19); occipital depth 12.8 (13); depth from middle of parietal to lower surface of audital bulla 18 (18); depth of rostrum at base of nasals 6.6 (6); depth of rostrum at middle of diastema 4.6 (5); mandible 39 (36); maxillary toothrow (behind diastema) 20 (19); mandibular toothrow (behind diastema) 17 (16.4).

Specimens examined.—Four: three from Pulo Bunoa, one from Big Tambelan Island.

Remarks.—The specimen from Big Tambelan agrees in all respects with those from Bunoa. Its hind foot measures 44 (41) mm. Tail imperfect. In color *Tupaia bunoa* is very constant, the four specimens showing practically no individual variation. The under side of the tail in *Tupaia tana* is a very deep ferruginous, approaching chestnut, while the ventral surface of the body is rich tawny ochraceous.

TUPAIA MALACCANA Anderson.

1879. *Tupaia malaccana* Anderson, Anat. and Zoöl. Researches, p. 134. ('Malacca.')

Three specimens from Linga Island agree in all essential characters with those given in the original description of this species, though the color of the underparts appears to be darker and that of the lower side

¹ Measurements in parenthesis are those of the specimen of *Tupaia tana* from Linga Island.

of the tail lighter than indicated by Anderson's account. Average measurements of the three individuals: total length 302 (298-305);

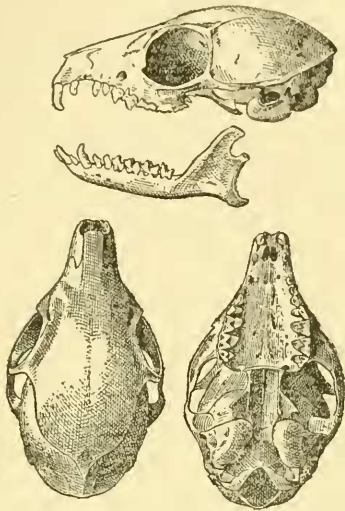


FIG. 14. *Tupaia malaccana*. Natural size.

head and body 138 (133-140); tail vertebræ 165; hind foot with claws 33.7 (32-34); hind foot without claws 31.5 (30-32.4).

TUPAIA SORDIDA sp. nov.

Type, adult male (skin and skull). No. 101747 United States National Museum. From Tioman Island. Collected October 2, 1899.

Characters.—Very similar to *Tupaia ferruginea* but slightly smaller, and color of flanks and underparts darker and less yellow. Skull shorter and broader than in *T. ferruginea*, but with distinctly narrower bony palate.

Color.—The color is so closely similar to that of *Tupaia ferruginea* that no detailed description is necessary. Underparts dull brownish buff, not very different from lower side of tail, slightly more yellow along middle of throat. Flanks somewhat darker and browner than in *T. ferruginea*.

Skull.—The skull of *Tupaia sordida* differs from that of *T. ferruginea* in slightly shorter rostrum, distinctly broader, less elongate braincase, broader frontal region and narrower palate; this last character in direct contradiction to the general features of the skull.

Teeth.—The teeth do not differ appreciably from those of *Tupaia ferruginea*.

Measurements.—External measurements of type: total length 336; head and body 171; tail vertebræ 165; pencil 25; hind foot 41 (38.8). External measurements of an adult female from the type locality: total length 318; head and body 178; tail vertebræ 140; pencil 20; hind foot 40 (37.6).

Cranial measurements of type: greatest length 49.6 (49.4)¹; basal length 46 (45.6); basilar length 43 (42.4); median palatal length 27 (25); length of nasals (posterior extremity not clearly determinable) 15.4 (—); distance from lachrymal notch to tip of premaxillary 22 (19); diastema 4 (3.6); width of palate between anterior molars 8 (9.4); lachrymal breadth 19 (17.4); breadth of rostrum at middle of diastema 7 (6.8); least interorbital breadth 15.4 (14); zygomatic breadth 25.4 (25); breadth of braincase above roots of zygomata 19.4 (18.8); least distance from inion to rim of orbit 21 (23); occipital depth 12 (13); depth from middle of parietal to lower surface of audital bulla 17.2 (17); depth of rostrum at base of nasals 7 (7.8); depth of rostrum at middle of diastema 5 (5.4); mandible 33.4 (32.6); maxillary toothrow (behind diastema) 15 (17); mandibular toothrow (behind diastema) 13 (13.6).

Specimens examined.—Two, both from the type locality.

Remarks.—*Tupaia sordida* differs from its mainland representative to about the same degree as the other insular members of the Tioman fauna.

TUPAIA CHRYSOMALLA sp. nov.

Type, adult female (skin and skull). No. 101710 United States National Museum. From Pulo Siantan, Anambas Islands, collected August 24, 1899.

Characters.—Size, proportions, and cranial characters as in *Tupaia ferruginea*. Color as in *T. ferruginea* except that shoulder stripes are even more indistinct. The back is tinged with dull ferruginous and the whole tail is suffused with golden yellowish brown which forms a clear band on under surface.

Color.—Summer pelage: back, sides, and outer surface of legs a fine grizzle of ferruginous and seal-brown, the former predominating, particularly in region between shoulders, the latter most conspicuous on legs. Head essentially like back but more finely grizzled and slightly tinged with gray. Underparts and inner side of legs dull

¹ Measurements in parenthesis are those of an adult male *Tupaia ferruginea* from Trong, Lower Siam.

grizzled tawny-olive, buff tinged on chest. Feet and ears seal brown, faintly grizzled. Shoulder stripes ill defined, dull ochraceous. Tail glossy seal-brown above, irregularly lightened and grizzled, especially through terminal half, by the appearance at surface of the light basal portion of the hairs. The basal portion of the hairs of the entire tail is a bright golden yellowish brown. Above this color is mostly hidden by the seal-brown tips, but beneath it forms a broad, clear area extending from base to and including pencil, and only a little darkened along extreme edge. Short hairs of under surface of tail less yellow than others, slightly grizzled with brown. Autumn pelage similar to summer coat but paler, the ferruginous of the back and sides replaced by ochraceous. The new coat first appears on shoulders and head, gradually extending backward and producing peculiar contrasts with the darker and brighter summer pelage.

Skull.—The skull of *Tupaia chrysomalla* so closely resembles that of specimens of *T. ferruginea* from Trong, Lower Siam, that I can see no characters to distinguish them.

Teeth.—The teeth are exactly as in *Tupaia ferruginea*.

Measurements.—External measurements of type: total length 330; head and body 178; tail vertebræ 152; pencil 30; hind foot 43 (40). Average of three specimens from Pulo Jimaja: total length 315 (305–330); head and body 180 (171–191); tail vertebræ 146 (140–152); hind foot 42.5 (42–43); hind foot without claws 41.

Specimens examined.—Four: one from Pulo Siantan, the others from Pulo Jimaja.

Remarks.—Except for the differences due to pelage, the four specimens are very uniform in color. The yellow of the tail is occasionally darker than in the type, approaching tawny-ochraceous, but never tinged with red. Under surface of tail never grizzled as in *T. palawanensis*.

MAGADERMA SPASMA (Linnæus).

1758. [*Vespertilio*] *spasma* LINNÆUS, Systema Naturæ I, 10th ed., p. 32. (Asia.)

Six specimens, two of which are skins, were collected on Pulo Bunoa, Tambelan Islands, August 5–7, and one on Big Tambelan Island. The color is faintly darker than in specimens from Trong, Lower Siam; but in size as well as in cranial and dental characters the insular bats show no peculiarities.

HIPPOSIDEROS BARBENSIS sp. nov.

Type.—Adult male (skin and skull). No. 101625 United States National Museum. From Ste. Barbe Island. Collected August 1, 1899.

Characters.—Like specimens of *Hipposideros larvatus* from Trong, Lower Siam, but smaller in size and duller in color.

Color.—Back dark hair-brown, the hairs yellowish drab-gray through basal two-thirds, the extreme tips wood-brown. On shoulders and head the hair-brown disappears, giving place on the former to the drab-gray and on the latter to the wood-brown. Entire underparts rather light and dull wood-brown, the extreme bases of the hairs tinged with slaty. Ears and membranes blackish. Immature specimens are less yellowish than the adults, but are otherwise similar.

Skull.—The skull of *Hipposideros barbensis* is throughout slightly smaller than that of mainland specimens of *H. larvatus*. Its form is peculiar in the shortness and relative breadth of the braincase; but in all structural details it closely agrees with that of the Siamese animal. Interpterygoid space shorter and relatively broader than in *H. larvatus*.

Teeth.—The teeth are slightly smaller than those of *Hipposideros larvatus*, but in form they show no peculiarities. In one specimen there is on the right mandible a minute premolar wedged between the two normally present.

Measurements.—For external measurements see table, page 240.

Cranial measurements of type: greatest length 21 (23);¹ basal length 18.2 (20); basilar length 16.2 (17.8); zygomatic breadth 12.4 (13); least interorbital breadth 3 (3.4); mastoid breadth 10.6 (11); greatest length of braincase 12 (14); greatest breadth of braincase above roots of zygomata 8.6 (9.6); frontopalatal depth (at middle of molar series) 4 (4); depth of braincase 6.4 (6.4); maxillary tooththrow (exclusive of incisor) 8.2 (9); mandible 14.4 (15); mandibular tooththrow (exclusive of incisors) 9 (9.8).

Specimens examined.—Five, all from the type locality.

Remarks.—By its dull color and small size this species is readily separable from its mainland representative, though in all details of structure and form the two animals are scarcely distinguished.

? RHINOLOPHUS ROUXII Temminck.

1835. *Rhinolophus rouxii* TEMMINCK, Monographies de Mammalogie, II (Huitieme Monographie), p. 30 b. Type locality, Calcutta.

1892. *Rhinolophus affinis rouxii* THOMAS, Ann. Mus. Civ. Stor. Nat. Genova, ser. 2, X, p. 923.

A bat in formalin, collected on Pulo Siantan, Anambas Islands, during September is apparently referable to the species recorded from

¹Measurements in parenthesis are those of an adult female *Hipposideros larvatus* from Trong, Lower Siam.

Burmah by Thomas, under the name *Rhinolophus affinis rouxii*. In size it agrees with the measurements of the Burman specimens; while the ridge beneath the free margin of the noseleaf is much more developed than in *Rhinolophus affinis*, and might readily be described as a supplemental leaflet. Without further material it is impossible to decide whether the island species is identical with that from the peninsula, or whether either is the same as the animal described by Temminck. That all three are closely allied there can be no doubt.

RHINOLOPHUS MINUTUS sp. nov.

Type.—Adult male (in alcohol). No. 101715 United States National Museum, Pulo Siantan, Anambas Islands, September, 1899.

Characters.—Similar to *Rhinolophus minor* Horsfield, but with shorter ear and tibia. First lower premolar in contact with third.

Color.—General color broccoli-brown, somewhat lighter below than above, the hairs everywhere with glossy pale tips, these most noticeable on underparts. Ears and membranes blackish brown.

Skull and teeth.—The skull is smaller than that of a specimen of *Rhinolophus minor* from the mainland of India, and the braincase is more narrow, but otherwise no important differences are apparent. Teeth as in *R. minor*, but first and third lower premolars strongly in contact, the second, therefore, wholly external to the tooth row.

Measurements.—For external measurements of *Rhinolophus minutus* see table, page 240.

Cranial measurements: greatest length 15; basal length 13.4; basilar length 11.8; zygomatic breadth 7.8; least interorbital breadth 2; mastoid breadth 7.8; greatest length of braincase 9.6; greatest breadth of braincase above roots of zygomata 6.8; frontopalatal depth (at middle of molar series) 3; depth of braincase 5; maxillary tooth-row (exclusive of incisors) 6.2; mandible 10.2; mandibular tooth-row (exclusive of incisor) 6.4.

Specimens examined.—Two (both in alcohol): one from Pulo Siantan, the other without definite locality.

Remarks.—Although this species is closely related to *Rhinolophus minor* its differently proportioned leg and foot appear to present sufficient reason for its recognition as a local form. The measurements of the type as given by Dobson show that *Rhinolophus minor* from Java (the type locality) agrees in proportions with specimens from the mainland.

EMBALLONURA ANAMBENSIS sp. nov.

Type, adult female (in alcohol). No. 101716 United States National Museum, Pulo Mobur, Anambas Islands, August 26, 1899.

Characters.—Similar to *Emballonura peninsularis* Miller¹ from Trong, Lower Siam, and *E. discolor* Peters from the Philippine Islands, but with fur nowhere whitish at base. Skull more slender than that of *E. peninsularis*.

Color.—General color above sepia, the hairs darkening nearly to seal-brown through terminal fourth, and becoming broccoli-brown at base. Beneath broccoli-brown tinged with drab, the extreme bases of the hairs slightly paler.

Skull.—The skull of *Emballonura anambensis* (fig. 15, *a*) differs from that of *E. peninsularis* (fig. 15, *b*) in its much more slender

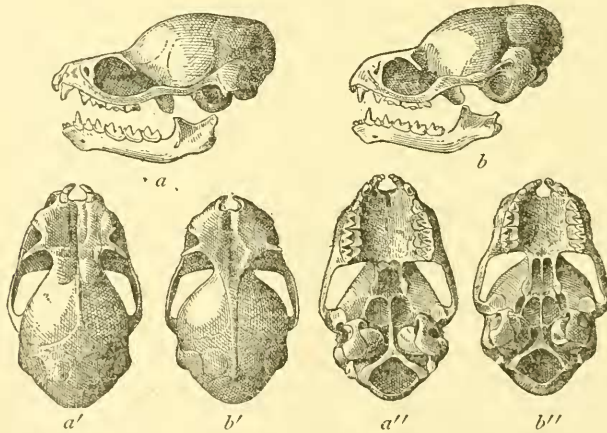


FIG. 15. *a* *Emballonura anambensis*, *b* *E. peninsularis*. Twice natural size.

general form. This is particularly noticeable in the braincase, but is visible in the rostral portion also. Viewed from the side and from below the differences are less apparent.

Teeth.—The teeth, though similar in form to those of *Emballonura peninsularis*, are smaller throughout, particularly the molars of the lower jaw.

Measurements.—For external measurements of *Emballonura anambensis*, see table, page 240.

Cranial measurements of type: greatest length 15; basal length 13.2; basilar length 11.4; greatest antorbital breadth 6; least interor-

¹ Proc. Acad. Nat. Sci., Philadelphia, 1898, p. 324.

bital breadth 3.4; zygomatic breadth 8.8; mastoid breadth 7.4; greatest length of braincase 9.6; greatest width of braincase above roots of zygomata 7; depth of braincase 5.6; frontopalatal depth (at middle of molar series) 1.8; maxillary toothrow (exclusive of incisors) 5.6; mandible 10.2; mandibular toothrow (exclusive of incisors) 5.8.

Specimens examined.—Four (in alcohol): two each from Pulo Mobur and Pulo Siantan, Anambas Islands.

Remarks.—*Emballonura anambensis* is a member of the group of large species containing *E. discolor* and *E. peninsularis*. From both of these it differs in the absence of the whitish bases of the hairs, while from the latter it is further distinguished by the form of the skull. Together with *E. peninsularis* it differs from *E. semicaudata*, the type of which is still extant in the collection of the United States National Museum, in the nearly parallel sides of the tragus.

PTEROPUS VAMPYRUS Linnæus.

1758. [*Vespertilio*] *vampyrus* LINNÆUS, Systema Naturæ, 1, 10th ed., p. 31. (Asia.)

Eight specimens from Linga Island, July 19, 20, and 21. These appear to differ little if any from a skin secured in Java by Mr. D. G. Fairchild.

PTEROPUS LEPIDUS sp. nov.

Type.—Adult female (skin and skull). No. 101670 United States National Museum. From Kaju Ara, or Saddle Island, Tambelan Islands. Collected August 15, 1899.

Characters.—Similar to *Pteropus condorensis* Peters from Pulo Condor, off the coast of Lower Cochin China, but quite different in color; the shining light gray back sharply contrasted with the dark reddish brown or blackish brown shoulders and neck.

Fur.—The fur of the back is silky in texture and closely appressed; the individual hairs about 12 mm. in length. On rump it becomes slightly woolly, but much less so than on other parts of the body. It extends down legs to knee, beyond which a narrow line runs down inner side of tibia to middle. Fur of shoulders, head, neck, and underside of body loose and somewhat woolly in texture, not at all appressed, and therefore appearing much longer than that of back, though the individual hairs are only about 14 mm. in length. It extends on lower side of legs to knees, and on humerus nearly to elbow, also sparsely over lower side of propatagium and on wing membrane along basal half of forearm. Upper surface of membranes naked except for a sprinkling of hairs along forearm.

Color.—Back a mixture of pearl-gray and pale broccoli-brown, the latter predominating posteriorly, the former anteriorly and along edge of wing membranes. The hairs have a distinct silky gloss. Shoulders, neck, chest, and upper side of head chestnut clouded irregularly with seal-brown and fading to light russet on forehead. Cheeks, region behind ears, and whole under side of head and throat seal brown faintly tinged with chestnut, and irregularly sprinkled with glistening

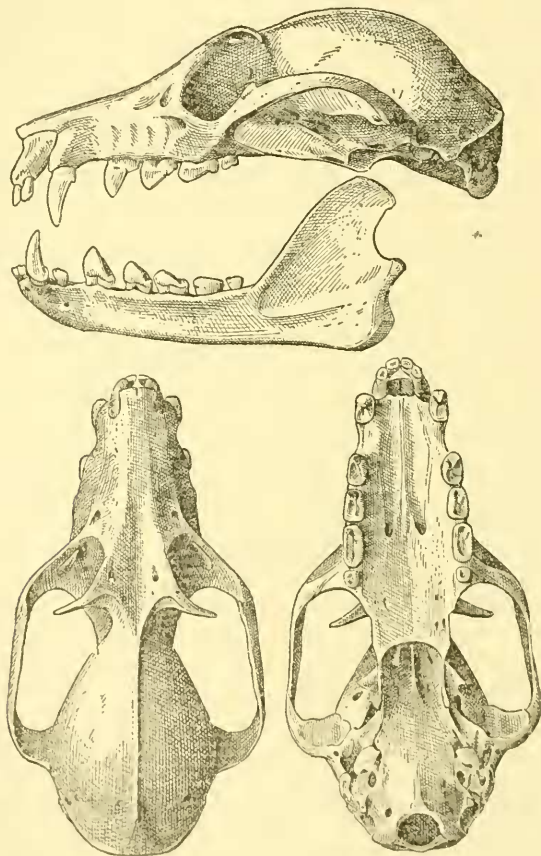


FIG. 16. *Pteropus lepidus*. (Type). Natural size.

silvery hairs. Underparts of body mostly broccoli-brown, irregularly shaded with seal-brown at sides of chest and with an undefined yellowish brown on middle of chest. Ears, membranes, and muzzle blackish. The four individuals show marked variation in color, chiefly through extension of the seal brown areas at the expense of

the chestnut. In one specimen the chestnut is almost hidden by the darker brown, though still visible beneath the surface when the fur is disarranged. Another skin, probably melanistic, is nearly uniform seal-brown throughout, though both chestnut of shoulders and gray of back are still faintly indicated.

Skull and teeth.—The skull and teeth of *Pteropus lepidus* (fig. 16) closely agree with that of *Pteropus condorensis* as figured by Matschie.¹ The palate appears to be narrower and the teeth less robust.

Measurements.—For external measurements of *Pteropus lepidus*, see table, page 240.

Cranial measurements of type: greatest length 64; basal length 60; basilar length 58; median palatal length 36; palatal breadth (between anterior molars) 11.4; zygomatic breadth 33.6; least interorbital breadth in front of postorbital processes 8; least interorbital breadth behind postorbital processes 7; breadth between tips of postorbital processes 21.6; greatest breadth of braincase above roots of zygomata 22.8; greatest depth of braincase 17.8; occipital depth 11.8; depth of rostrum at middle of diastema 8; mandible 50; maxillary toothrow (exclusive of incisors) 25; mandibular toothrow (exclusive of incisors) 27.6; crown of third upper premolar 4.4×3 ; crown of first upper molar 5.6×3 ; crown of first lower molar 4.4×2.4 .

Specimens examined.—Four: one from Saddle Island, the rest from Big Tambelan.

Remarks.—This light bright colored species is evidently a near relative of the sombre *Pteropus condornesis*. It apparently needs no comparison with other species.

SEMNOPIITHECUS MAURUS (Schreber).

1775. *Simia maura* SCHREBER, Säugthiere, 1, pl. xxii B.

One specimen (adult female, No. 101601) taken on Linga Island, July 19, 1899.

MACACUS 'CYNOMOLGUS' Auct.

Two males of this species were taken on Linga Island, July 23, 1899, and another on Tioman Island, October 4. The Linga specimens agree in all respects with those previously collected by Dr. Abbott on the mainland. That from Tioman Island is smaller, but the peculiar condition of the skull shows it to be a dwarfed and abnormal individual.

¹ Die Fledermäuse der Berliner Museums für Naturkunde, pl. 8, fig. 2.

MEASUREMENTS OF BATS FROM ISLANDS OF THE NORTH CHINA SEA.

Name.	Locality.	No.	Sex.	Length.	Tail.	Tibia.	Foot.	Calcar.	Forearm.	First digit.	Second digit.	Third digit.	Fourth digit.	Fifth digit.	Ear from meatus.	Ear from crown.	Width of ear.
<i>Rhinolophus minutus.</i>	Siantan, Anambas.	101715 ¹	♂	58	16.4	14	7.8	10	39	5	27	56	45	47	15.6	13.6	12
" <i>minor.</i>	Lingasuqur, India.	14533	♂	67	19	16	7.4	10	39	6	32	60	51	50	17	14.4	12
<i>Hipposideros barbensis.</i>	Ste. Barbe I.	101625 ¹	♂	78	19.4	19.4	9.8	11	55.4	10	43	78	61	60	18.4	15	16
<i>Emballonura anambensis.</i>	Siantan, Anambas.	101716 ¹	♀	59	13	17	7	13	44	7	36	70	48	45	10.6	10.4	9
" "	" "	101712	♀	58	13.4	17.4	6.4	13	46	7.4	37	75	50	48	11	10.4	10
" "	" "	101713	♀	64	14.4	16	6.6	14	44	6	37	73	50	47	13	11.4	9
<i>Pteropus lepidus.</i>	Saddle I.	101670 ¹	♀	222	—	58	40	13	133	61	103	255	200	175	22	20	14.4
" "	Big Tambelan I.	101649	♀	229	—	63	43	14	135	61	99	260	205	184	24	22	16
" "	" "	101650	♀	216	—	57	41	14	128	59	96	255	200	177	22.4	21	16
" "	" "	101651	♀	222	—	65	43	15	136	62	100	260	207	185	21	19	15

¹Type.

MACACUS PUMILUS sp. nov.

Type.—Adult male (skin and skull). No. 101639 United States National Museum, Pulo Bunoa, Tambelan Islands, August 6, 1899.

Characters.—A dwarf form of *Macacus* 'cynomolgus.' Colors slightly paler than in specimens from the mainland.

Color.—The color is so nearly like that of the common *Macacus* 'cynomolgus' of the mainland that no detailed description is necessary. Throughout it is a shade more pale, particularly on the throat, chest, belly, and inner side of thighs.

Skull and teeth.—Except for their smaller size the skull and teeth resemble those of *M.* 'cynomolgus,' though the palate appears to be broader and less arched. The crowns of the molars are more squarish in outline than those of the mainland animal and the posterior upper tooth is relatively smaller.

Measurements.—External measurements of type: total length 990; head and body 431; tail vertebræ 559; hind foot 120. External measurements of an adult male from Pulo Siantan, Anambas Islands: total length 1003; head and body 470; tail vertebræ 533; hind foot 117.

Cranial measurements of type: greatest length (exclusive of incisors) 110 (123);¹ basal length 83 (92); basilar length 77 (87); least palatal length 37.4 (45); palatal breadth (between front molars) 21.6 (19); zygomatic breadth 77 (81); mastoid breadth 56 (61); greatest breadth of braincase above roots of zygomata, 53 (53); least breadth of braincase immediately behind orbits 39.4 (39.6); orbital breadth, 59 (64); least distance from orbit to alveolus of inner incisor 36 (43); greatest depth of braincase (exclusive of sagittal crest) 45 (45); mandible 81 (92); greatest depth of ramus 17.8 (21.4); maxillary toothrow (exclusive of incisors) 35.6 (41.4); mandibular toothrow (exclusive of incisors) 41 (46.4); crown of middle upper molar 7 × 8 (7.8 × 7.8) crown of middle lower molar 6.8 × 7 (8 × 6.8).

Specimens examined.—Four, from the following localities: Pulo Bunoa, Tambelan Islands,² Pulo Wai, Tambelan Islands, 1; Pulo Siantan, Anambas Islands, 1.

Remarks.—The small macac of the Tambelan and Anambas islands appears to differ very constantly in size from the large *Macacus* 'cynomolgus' of the mainland and Linga Island. In color the two animals are essentially alike.

¹ Measurements in parentheses are those of a younger male *M.* 'cynomolgus' from Trong, Lower Siam.

NOTES ON THE FAUNA OF THE ISLANDS VISITED.

Dr. Abbot writes that in physical characteristics the islands differ from each other very slightly. All are of granite formation and toward the interior are elevated above sea level to a height of about 1,000 to 2,000 feet. Tioman and Linga rise somewhat higher, the former to 3,500 feet, the latter to 4,000 feet. The surface was originally covered with a uniform growth of heavy forest; but clearings have been made on the larger islands, while some of the smaller ones are nearly stripped of the original growth. Cocoanuts and sago are grown in the Anambas and Tambelans.

LINGA ISLAND.

Mus lingensis.—Taken in heavy forest at elevation of about 1000 feet. "Very numerous."

Sciurus tenuis.—"Common."

Sciurus notatus.—"Very common, especially in the cocoanut plantations."

Ratufa sp. ?—"Not met with, but natives said that a large squirrel existed."

Tragulus javanicus ?—

Tragulus napu.—

Tragulus sp.—"Two kinds of napu were said by the natives to exist, a small or common kind, of which they brought me a female [*T. napu*], and a large species which they said was confined to the mountain forests and which I did not meet with. The little kanchil was said to be plentiful in the mangroves, but I saw no specimens."

Sus sp.—"A pig was common, especially about the sago plantation. Saw the bed of one on the mountain side at an elevation of 3,000 feet." None taken.

Tupaia tana.—"Only one shot. Saw a few others; all on the mountains and in heavy forest." A specimen is marked "2,000 feet."

Tupaia Malaccensis.—"Common in the plantations. One shot on mountain at 2,000 feet altitude. Generally found in trees."

Pteropus vampyrus.—"Common in the plantations at night. Especially fond of rambutans."

Macacus 'cynomologus'.—"Very common."

Scenopithecus maurus.—"Less common than *Macacus*. I saw it in both lowland jungle and in mangroves; also on the mountains up to about 2,000 feet."

In addition to these species a *Manis* and two small carnivores probably occur. Of the latter Dr. Abbott writes: "Natives said there were two sorts of musangs. One, the larger, which they called tangalunga, was probably *Viverra tangalunga*; the other, a smaller animal may have been *Paradoxurus hermafroditus*."

PULO TAYA.

"No mammals obtained. Some fishermen who were visiting the island said that squirrels and rats existed. We saw some rats, but no squirrels."

PULO PENGIKI OR STE. BARBE ISLAND.

"The island is about three miles long and one and one-half broad. Covered with heavy forest."

Sciurus mimculus.—"Common, especially near sea shore."

Hipposideros barbensis.—"Very numerous. Flying about the forest all day."

Macacus 'cynomolgus.'—"Common." No specimens taken.

"Mr. Kloss saw a small mammal like a musang, but did not get a shot at it."

TAMBELAN ISLANDS.

PULO BUNOA.

"Contains 4,000 or 5,000 acres. Covered with heavy forest except where a few clearings were being made along the coast."

Mus tambelanicus.—"Rats were common."

Sciurus abbotti.—"A pale variety of *Sciurus notatus* was common."

Tragulus sp.—"Plandok (*Tragulus javanicus*) were said by the natives to be common." None obtained.

Tupaia bunoa.—"Fairly common, especially in low brushwood."

Megaderma spasma.—"A bat (*Megaderma*) was common in some caves and crevices near the shore."

Pteropus lepidus?—"A single *Pteropus* of small size and gray color was seen. It was probably the same as the species afterward obtained on Big Tambelan Island."

Macacus pumilus.—"Common."

"Two small islands, Pulo Gilla and Pulo Selindang, close by, contained only monkeys and rats."

BIG TAMBELAN ISLAND.

Mus tambelanicus—One specimen. No notes.

Sciurus abbottii.—Ten specimens. No notes.

Tragulus sp.—“Plandok said to be very common in the mangroves, but I could get none of them trapped. Of course it is impossible to shoot them.”

Tupaia bunoa.—“Very common.”

Megaderma spasma.—One specimen. No notes.

Pteropus lepidus.—“Three specimens of a small *Pteropus* obtained. All were shot while they hung to the leaves of avvenga palms. The natives said that a large species was also found.”

Macacus pumilus.—“Plentiful and tame.”

PULO WAI.

Mus tambelanicus.—One specimen taken.

Sciurus mimellus.—“Several squirrels seen and a pair shot. They were considerably larger than the similar ones [*S. mimiculus*] obtained on Ste. Barbe Island.”

Macacus pumilus.—“Monkeys were common.”

“Natives said that a *Tupaia* and the variety of *Sciurus notatus* [*S. abbottii*] which we got on Big Tambelan and Bunoa were also on this island, but we saw neither.”

KAJU ARA OR SADDLE ISLAND.

“This island is formed of two hills joined by a ridge. It is about $\frac{1}{2}$ mile long and $\frac{1}{4}$ mile wide.”

Sciurus klossii.—“A small variety of *Sciurus notatus* was very numerous.”

Pteropus lepidus.—“A single *Pteropus*, the same as that taken on Big Tambelan, was shot.”

ANAMBAS ISLANDS.

“Natives said that musanges (*Paradoxurus*) and plandok (*Tragulus*, 2 sp.?) were common on all the islands of the group, but we saw none.”

PULO PILING.

“Saw no mammals except monkeys” [probably *Macacus*].

PULO RIABU.

Sciurus anambensis.—One taken. No notes.

“Saw monkeys, but obtained none.”

PULO SIANTAN.

“The second largest of the group. Contains about 20,000 acres, mostly covered with heavy forest.”

Mus anambæ.—

Mus strepitans.—

Mus siantanicus.—"We trapped rats of several species. They seemed very numerous in individuals."

Sciurus tenuis.—"Common."

Sciurus anambensis.—"Common."

Funambulus castaneus.—"Only one seen."

Tragulus sp.—"One seen."

Tupaia chrysomalla.—"Common."

Rhinolophus rouxi? One specimen. No notes.

Rhinolophus minutus.—One specimen. No notes.

Emballonura anambensis.—Two specimens. No notes.

Nycticebus sp.—"A wretched caged specimen of *Nycticebus* was brought me, but it was in such bad condition that I would not take it. Am sorry I did not, as I never saw another."

Macacus pumilus.—"Common."

PULO MATA AND PULO MOBUR.

"These are large islands lying north of Siantan and separated from it by a narrow strait. On each we saw monkeys, squirrels and tupaia." Two specimens of *Emballonura anambensis* taken on Pulo Mobur are not mentioned in the field notes.

PULO TELAGA.

"Monkeys and a variety of *Sciurus notatus* seen."

PULO JIMAJA.

"This is the largest island in the group. It probably contains 30,000 acres."

Mus flaviventer.—

Mus anambæ.—

Mus strepitans.—No special notes on the rats obtained.

Ratufa anambæ.—"Fairly common, and frequenting both heavy forest and secondary jungle. Especially plentiful and tame along a small creek (Sungei Maras) which is much used by canoes."

Sciurus tenuis.—"Common."

Sciurus anambensis.—"Common."

Tragulus sp.—"Common."

Tupaia chrysomalla.—"Common."

Nycticebus sp.—"Saw a miserable specimen in captivity."

Macacus pumilus.—"Common."

TIOMAN ISLAND.

Mus vociferans?

Mus tiomanicus.—

Mus obscurus.—No special notes on these three species.

Ratufa tiomanicus.—“Common.”

Sciurus tenuis.—“Common.”

Sciurus tenuirostris.—“Common.”

Tupaia sordida.—“Common.”

Paradoxurus hermaphroditus.—“One obtained.” No detailed notes.

Tragulus rufulus.—“Common. Six specimens were brought in by natives.”

Macacus “*cynomlogus.*”—Common. Natives say there is no other monkey found on the island.